

Operating and Service Manual

MAN9515 Rev. 2.1 Mar. 2004 edition

Vertical Display and Storage

TMEF650

SKOPE Single Door Economy Freezer



SKOPE[®]
Refrigeration

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TMEF650
Operating and Service Manual

MAN9515
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TABLE OF CONTENTS

1 SPECIFICATIONS

1.1	Features	7
1.2	Cabinet and Refrigeration Unit	8

2 INSTALLATION

2.1	Introduction	9
2.2	Positioning of Machine	9
2.3	Ventilation	10

3 OPERATION

3.1	Safety Information	11
3.2	Operation of Machine	12
3.3	Loading	14
3.4	Cleaning	14

4 ELECTRONIC CONTROLLER

4.1	Controller Display	15
4.2	Controller Components	16
4.3	Operation of Controller	17
4.4	Parameters	19
4.5	Alarms and Signals	22
4.6	Replacement	25

5 SERVICE INSTRUCTIONS

5.1	System Service Notes	26
5.2	Pre-Service Check Information	28
5.3	Interior Side Light	29
5.4	Doors	30
5.5	Refrigeration Unit.	32
5.6	Pressure Temperature Chart.	35
5.7	Trouble Shooting Chart	36

TABLE OF CONTENTS

6 WIRING DIAGRAM

6.1	Model TMEF650	40
-----	-------------------------	----

7 SPARES

7.1	Cabinet Assembly	42
7.2	Door	43
7.3	Refrigeration Unit	44

8 NOTES

8.1	Notes	45
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1 SPECIFICATIONS

1.1 Features

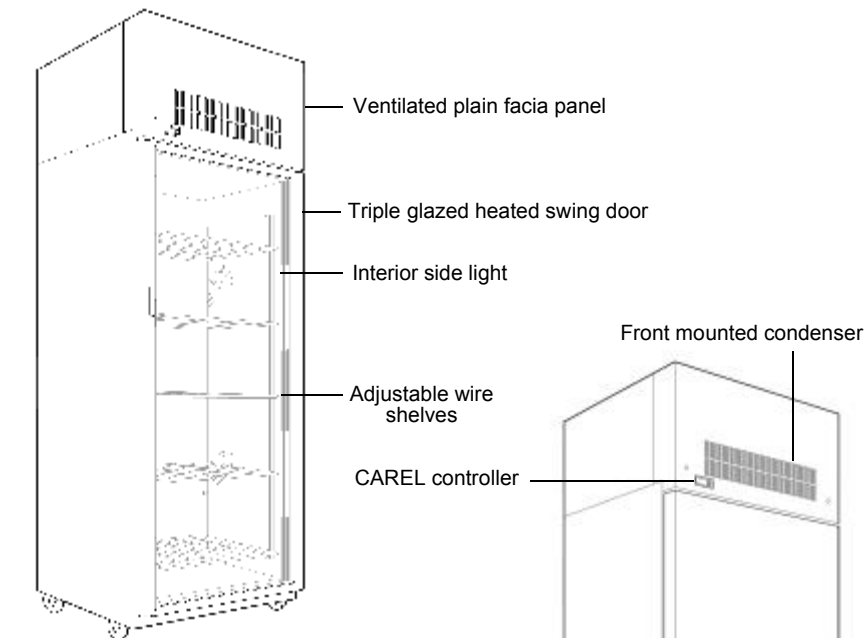


Figure 1: Glass Door Model

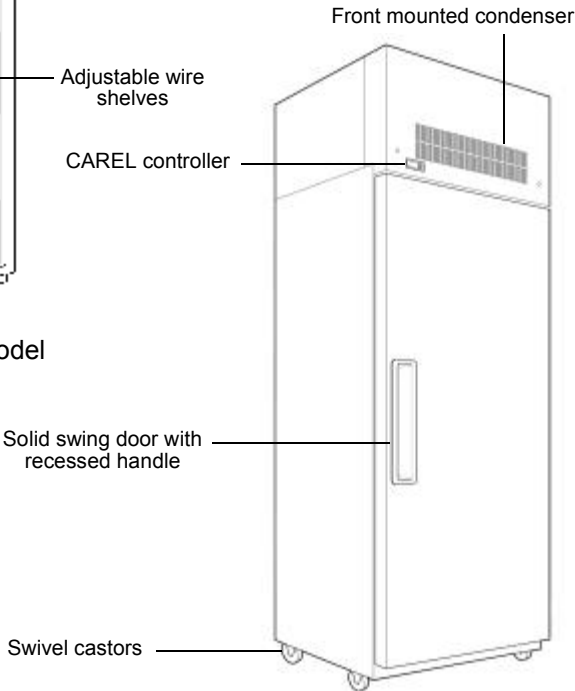


Figure 2: Solid Door Model

1 SPECIFICATIONS

1.2 Cabinet and Refrigeration Unit

CABINET CONSTRUCTION

Exterior/Interior: White powdercoat on galvanised steel.
Insulation: 50mm thick, polyurethane foam.
Cyclo-iso Pentane blowing agent: C₅H₁₀/C₅H₁₂

DIMENSIONS

Height: 2195mm
Width: 740mm
Depth: 700mm
Floor area: 0.52m²
Internal volume: 610 litres

REFRIGERATION

Top mounted SKOPE Cyclone® refrigeration unit:
Nominal capacity: 690 Watts
Compressor: Danfoss SC18CL
Refrigerant: R404A
Charge: 550 grams

ELECTRICAL

230-240 Volts a.c. 50 Hz, single phase power supply.
Run Amps: 7.2 Amps

LIGHTING

Interior side light: 58 Watt (5ft) fluorescent tube (glass door model)

DOORS

Self-closing, aluminium framed, triple glazed, heated, toughened safety glass, or self-closing, foam filled, galvanised steel solid door.

SHELVES

White powdercoated, adjustable height, steel wire shelves.

2 INSTALLATION

2.1 Introduction

The new TMEF650 freezer is designed to better integrate the installation of the SKOPE chiller and freezer products, while also providing a more cost effective alternative to the existing range of SKOPE CLF/SKF freezers. New features of the TMEF650 freezer include:

- Front mounted condenser
- 5 foot interior side light
- The ability to be pushed hard back against the wall
- Quieter running
- 10 Amp plug

2.2 Positioning of Machine

The mains flex exits out the top of the refrigeration unit. The flex should be retrieved before the machine is positioned, when walls and partitions may make access difficult.

For efficient operation of machine, it is essential that adequate ventilation be provided above the refrigeration unit. When positioning the machine, a gap must be left between the top of the refrigeration unit and ceiling, of at least 200mm. Maximum recommended operating ambient temperature for the machine is 25°C.

When siting the machine, avoid direct sunlight, warm draughts etc., and adequate allowance should be made for door opening. The door has an internal torsion bar which is pretensioned at the factory. The machine must be positioned on a level surface for the door to shut and seal correctly, and to prevent the condensate tray from overflowing.

Remove all packaging material from the shelves. Fit shelf support brackets at the desired heights and relocate shelves.

2 INSTALLATION

2.3 Ventilation

Even though the machine can be positioned hard against a back wall, adequate ventilation of the refrigeration unit is essential. Air surrounding condenser must not exceed 30°C. Never store cardboard cartons or other items on top of the refrigeration unit.

Warning:

Adequate ventilation of the refrigeration unit is essential.

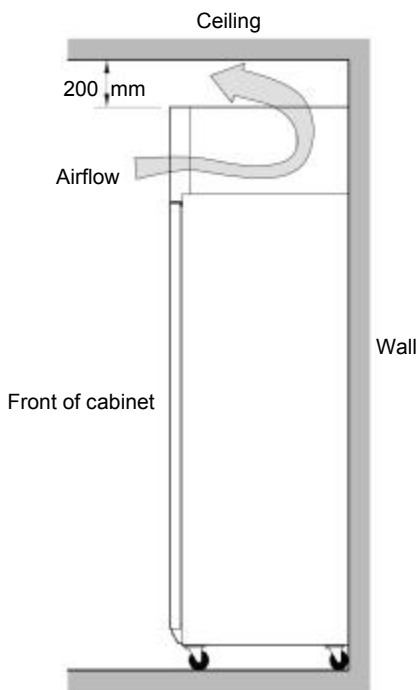


Figure 3: Ventilation

3 OPERATION

3.1 Safety Information

When using any electrical appliance, basic safety precautions should always be observed.

READ THESE INSTRUCTIONS CAREFULLY.

Do not use this appliance for other than its intended use.

Warning:

Do NOT overload power supply.

Machine rated at 7.2 Amps @ 240 Volts

- Use this appliance only on the voltage specified on the rating plate, or in these instructions.
- Ensure ventilation of SKOPE refrigeration unit.
- Condenser coil MUST be kept clean. To ensure trouble free performance, it is recommended that on a regular basis the unit be isolated from the power supply and a vacuum cleaner used to remove dust and fluff from the condenser.
- Be very careful not to touch moving parts.
- Do not cover the grilles or block the entry or exhaust of airflows.
- Do not probe any opening.
- Disconnect machine mains power supply before attempting to perform any electrical service or maintenance.
- Regulations require that all electrical work be carried out only by authorised persons. For your own safety and that of others, ensure this is done.
- If the refrigeration unit is required to be installed or removed from the cabinet, ensure all necessary safety precautions are observed.

3 OPERATION

3.2 Operation of Machine

The operation of this machine is controlled by a pre-programmed Microprocessor Controller.

Lights

Lights run continuously as standard, when plugged into SKOPE Cyclone® unit. The option of a switch exists.

Condenser Fan

Condenser fan runs continuously.

Refrigeration Run Cycle

Initiated by the controller when 'Cabinet Ambient Probe Temperature' is warmer than the setpoint, plus the differential temperature (e.g. setpoint -21°C; differential 3°C; therefore refrigeration run initiates at temperatures warmer than -18°C).

- The compressor will start and run until setpoint temperature is reached (except during defrost). The compressor has a one minute time delay, when cabinet is first plugged into power supply.
- Evaporator fan will start after the 'Defrost Probe' reaches -8°C, and will remain running while the evaporator is below this temperature (except during defrost).

Refrigeration Off Cycle

- Initiated by Controller when the 'Cabinet Ambient Probe' reaches the setpoint (e.g. -21°C).
- Compressor shuts off.

3 OPERATION

Defrost Cycle

Defrost Cycle will override the refrigeration cycle. Initiation by either:

- At 6 hourly intervals after being plugged in.
- A manual defrost will occur if the Defrost button on the controller is held down for 5 seconds (if keypad is enabled).

Note:

Defrost will NOT occur if the evaporator temperature is above 5°C.

Defrost Initiation

- Compressor OFF
- Evaporator fan OFF
- Defrost elements ON

Defrost Termination

Defrost termination is achieved when defrost probe reaches 12°C or after 22 minutes, whichever occurs first:

- Defrost elements off.
- A drip time of 3 minutes, then compressor and evaporator fan delay of 1 minute.
- Refrigeration run cycle begins.

3 OPERATION

3.3 Loading

Shelves may be positioned at different heights to suit various products. Always ensure that the shelf clips are securely engaged in each of the four shelf support strips. Support strips are marked '+' for easy location of shelf clips.

For even cooling and efficient operation, allow air space around packages etc. Do not allow products to overhang the front of the shelf as this could prevent the door from shutting or cause glass breakage. Leave an airspace of at least 75mm (3") above packages etc. on the top shelf.

Warning:

Product **MUST NOT** be stored on floor of cabinet.

3.4 Cleaning

When necessary, wash both interior and exterior of cabinet with soapy water. Exterior of cabinet may be waxed with automobile polish for extra protection.

The condenser coil must be kept clean for efficient and reliable operation. The machine must be disconnected from the mains supply before cleaning the condenser.

Warning:

Condenser coil **MUST** be kept clean for efficient and reliable operation.

Clean with a brush and vacuum cleaner regularly.

4 ELECTRONIC CONTROLLER

4.1 Controller Display

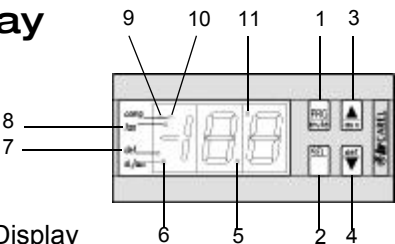






Figure 4: Controller Display

1		Silences alarm buzzer Allows entry to frequent parameters section, if pressed for 5 seconds Allows entry to configuration parameters section, if pressed simultaneously with 'SEL' for 5 seconds Locks in new parameters, and exits parameter sections Activates reset procedure
2		Displays setpoint in run mode Displays selected parameter in parameter mode Allows entry to configuration parameters section if pressed simultaneously with 'PRG' for 5 seconds
3		Adjustment locked out Alters parameters in parameter mode Activates and deactivates continuous refrigeration mode with 'def' key
4		Adjustment locked out Activates manual defrost cycle Alters parameters in parameter mode Activates and deactivates continuous refrigeration mode with 'aux' key
5		Decimal point indicator
6		Unused
7		Defrost cycle on indicator
8		Evaporator fan on indicator
9		Continuous refrigeration mode on indicator (fast freeze)
10		Compressor on indicator
11		Remote controller indicator

4 ELECTRONIC CONTROLLER

4.2 Controller Components

COMPONENT	DESCRIPTION
Microprocessor:	Located behind ventilated plain facia panel.
Controller Module:	Located in control box. Performs processor switching.
Module Connector Cable:	Flat black cable connecting module to microprocessor.
Probes:	2 x NTC probes are used.

- A controlling probe located on a receptacle in the evaporator box; called a 'Cabinet Ambient Probe'.
- An evaporator probe located within the evaporator coil; referred to as a 'Defrost Probe'.

4 ELECTRONIC CONTROLLER

4.3 Operation of Controller

Microprocessor

The operation of this freezer is controlled by a pre-programmed microprocessor. The Microprocessor display indicates the temperature of the cabinet ambient probe, except during a defrost where the temperature of the cabinet probe is locked in, and during an alarm condition.

The display also has LED indicators showing the activation of the compressor, the fan and the defrost. At alarm activation, the display indicates the type of alarm signal, and an audible alarm sounds. The alarm can be muted at the controller.

Changing Controller Settings

To access / entry:

1. Press and hold PRG and SEL simultaneously for more than 5 seconds, until **00** is displayed.
2. Press aux (up) until **22** is displayed.
3. Press SEL to confirm selection. The first parameter **/C** displays.

To turn Keypad on:

1. Follow Access / Entry above, until the first parameter **/C** is displayed.
2. Press def (down) two times, until **H2** is displayed.
3. Press SEL to display the 'value' of the parameter.
4. Press aux (up) to increase or def (down) to decrease, until **01** is displayed.
5. Press SEL to accept the 'value'.
6. Press PRG to lock in new value and to exit program.

4 ELECTRONIC CONTROLLER

Setpoint

Factory setting:	-21°C
Maximum:	-16°C
Minimum:	-26°C

To adjust Setpoint (with Keypad on):

1. Press SEL key for 1 second and the 'Setpoint' will be displayed. On releasing the key, the display will flash.
2. To alter the 'Setpoint', press aux (up) or def (down).
3. Press SEL to lock in the value and return to cabinet temperature.

Manual Defrost (with Keypad on)

Press def (down) key for more than 5 seconds to manually initiate a defrost.

Continuous Refrigeration (with Keypad on)

Press aux (up) and def (down) together, (down key first) to initiate a 'Continuous Refrigeration' mode. The compressor will run without interruption to the parameter 'cc' (6 hours: SKOPE programme). Its purpose is to achieve a fast product pull-down.

Display Function

During run mode, the display shows the value measured by the 'Cabinet Ambient Probe'. In alarm status, the display indicates the relative alarm code.

Buzzer Off

Press mute key to silence the buzzer. The alarm display remains while the alarm condition exists.

4 ELECTRONIC CONTROLLER

4.4 Parameters

Frequent Parameters 'F' (with Keypad on)

No password is required to enter this section.

1. Press PRG key for more than 5 seconds to enter this parameter section.
2. Press aux (up) or def (down) to scroll through the parameters.

Configuration Parameters 'C'

A password is required to enter.

1. Press PRG and SEL simultaneously for more than 5 seconds. **00** is displayed.
2. Press aux (up) or def (down) until **22** is displayed.
3. Press SEL to confirm. The first modifiable parameter code is displayed.

Parameter Modification

1. Press aux (up) or def (down) to show the code of the parameter that has to be changed.
2. Press SEL to display the selected parameter value.
3. Press aux (up) or def (down) to increase or decrease the value.
4. Press SEL to temporarily confirm the new value, and display its code.
5. Repeat above procedures to alter further parameters.
6. Press PRG to lock in the new parameters and exit parameter modification procedure.

Note:

For parameters **A6** and **c4**: If parameter = 0; the compressor would not run at all. If parameter = 100; the compressor would run continuously.

4 ELECTRONIC CONTROLLER

4.4 Parameters

SKOPE Parameters for CAREL Controller IR32POLBRO							
SETPOINT: -21°C.							
SKOPE Settings			Type	Min	Max	Def	PARAMETER
PA	22		C	00	199	22	Password
PROBE PARAMETERS							
/0	0	NTC probe	n.a.	0	1	0	Type of probe used (NTC or PTC). Available after 'Reset Procedure'
/C	20	2°C	F	-20	20	0	Calibration offset for cabinet temperature display (0.1°C)
/2	04	-	C	1	15	4	Probe reading stability (lower the number, faster the response)
/3	08	-	C	1	15	8	Probe reading speed (lower the number, slower the response)
/4	00	probe	C	0	100	0	Designation as controlling probe
/5	00	°C	C	0	1	0	Units of temperature measurement
/6	00	Yes	C	0	1	0	Decimal point display
CYCLE PARAMETERS							
rd	3.0	3°C	F	0.1	20	2	Refrigeration differential
r1	-26	-26°C	C	-40	r2	-40	Minimum allowable set point
r2	-16	-16°C	C	r1	199	90	Maximum allowable set point
r3	01	Yes	C	0	1	0	Enabling of ED alarm (defrost interrupted because maximum duration has been reached, parameter dP) 0=No, 1=Yes
r4	3.0	3	C	0	20	3	Automatic Set-point variation during night functioning. That is when the curtain switch is closed, with either A4 or A5=7
r5	01	Yes	C	0	1	0	Enabling of minimum / maximum temperature monitoring
rt	-	-	F	0	199	-	Actual interval in maximum / minimum temperature reading
rH	-	-	F	-50	+90	-	Maximum temperature reading in the 'rt' interval
rL	-	-	F	-50	+90	-	Minimum temperature reading in the 'rt' interval
COMPRESSOR PARAMETERS							
c0	01	1 min	C	0	15	0	Compressor and evaporator fan start delay at power on
c1	03	3 mins	C	0	15	0	Minimum time between compressor starts
c2	03	3 mins	C	0	15	0	Minimum compressor OFF time
c3	00	0	C	0	15	0	Minimum compressor ON time
c4	99	99 mins	C	0	100	0	Comp backup for 'Ambient' probe failure (On for c4, off for 15 min)
cc	04	4 hours	C	0	15	4	Duration of 'Continuous Refrigeration Mode'
c6	02	2 hours	C	0	15	2	Duration of alarm override after 'Continuous Refrigeration Mode'
DEFROST PARAMETERS							
d0	00	Electric	C	0	1	0	Type of defrost
d1	06	6 hours	F	0	199	8	Time interval between defrosts
dt	12	12°C	F	-40	199	4	Defrost termination temperature
dP	22	22 mins	F	1	199	30	Maximum defrost time
d4	00	No	C	0	1	0	Defrost at cabinet plug in
d5	00	No	C	0	199	0	Defrost delay at cabinet plug in
d6	01	Yes	C	0	1	1	Lock in temperature display during defrost
dd	03	3 mins	F	0	15	2	Defrost drip time, before compressor and evaporator fan start
d8	01	1 hour	F	0	15	1	Continuation of d6 at defrost end (until setpoint or d8 elapses)
d9	00	No	C	0	1	0	Compressor protection times observed at defrost (c1, c2, c3)
d/	-	-	F	n.a	n.a	n.a	Evaporator temperature (via defrost probe) is displayed
dC	00	hrs / mins	C	0	1	0	Time basis for parameter "dl" and "dp"

Table 1: CAREL Controller Parameters - continued on next page.

4 ELECTRONIC CONTROLLER

4.4 Parameters

SKOPE Parameters for CAREL Controller IR32POLBRO							
SETPOINT: -21°C.							
SKOPE Settings			Type	Min	Max	Def	PARAMETER
ALARM PARAMETERS							
A0	1.0	1.0°C	C	0.1	20	0.2	Alarm and fan differential
AL	10	-32°C /-31°C	F	0	199	10	Low temp alarm (On=Setpoint -AL-A0) (Off=Setpoint -AL)
AH	09	-11°C /-12°C	F	0	199	10	High temp alarm (On=Setpoint +AH+A0) (Off=Setpoint +AH)
AD	60	60 minutes	C	0	199	120	Alarm delay time
A4	01	ON	C	0	5	0	Immediate external alarm i.e. High pressure switch trip
A5	00	-	C	0	5	0	Not used. must be 0
A6	99	99 minutes	C	0	100	0	Compressor run lock time due to A4 function. Compressor will still cycle with HP switch
A7	00	-	C	0	199	0	Not used. must be 0
FAN PARAMETERS							
F0	02	ON	C	0	1	0	Evap. fan control type (controlled by Evap. Defrost Probe)
F1	14.0	-8°C /-7°C	F	0	20	5	Evaporator fan start temperature (On=Setpoint +F1 -A0) (Off=Setpoint =F1)
F2	00	No	C	0	1	1	Fans off while compressor is off
F3	01	Yes	C	0	1	1	Fans off during defrost
Fd	01	1 minute	F	0	15	1	Fan delay after defrost
OTHER SELECTIONS							
H0	00	-	C	0	15	0	Serial address
H1	00	-	C	0	1	1	Not used. Must be 0
H2	00	No	C	0	3	1	Enable keypad and remote control (Must be '01' to enable)
H3	00	00	C	0	199	0	Password for remote control

Warning:

- The above parameters are set exclusively for the SKOPE TMEF650 freezer program, with its dedicated CAREL controller.
- Any alterations from this program may adversely effect the SKOPE freezer operation.
- For full specifications, a detailed CAREL controller manual is available.

Table 1: CAREL Controller Parameters - continued.

4 ELECTRONIC CONTROLLER

4.5 Alarms and Signals

A flashing LED indicates a time delay on the indicated function. The following is a list of the LED displays.

El flashing...

- Indicates faulty defrost probe.
- The defrost cycle will only terminate on 'maximum defrost time' (**d4**).
- The evaporator fan will start immediately after its time delay (**dd**, **Fd**, **c0**).
- The refrigeration cycle will continue as normal.
- The alarm buzzer does not sound.

EO displayed...

- Indicates a faulty cabinet ambient probe.
- The controller switches to parameter **c4**; where the compressor will cycle with run intervals of **c4** time, followed by 15 minutes off. No defrost is possible. The alarm is on.

LO flashing...

- Indicates low temperature alarm. The cabinet has reached -32°C (parameter **AL** =10).
- The alarm is overridden when temperature returns above -31°C (parameter **AO** =1).

HI flashing...

- Indicates high temperature alarm.
- The alarm is overridden when the temperature returns below -12°C.
- Check parameters; **AH** =9, **AO** =1, **Ad** =30.

4 ELECTRONIC CONTROLLER

IA flashing...

- Refrigeration unit over-pressure alarm. The refrigeration unit has tripped on its auto-reset high pressure switch. Once a trip has occurred, a latching relay maintains alarm status.
- Check, and if necessary clean condenser coil.
- Check condenser fan operation, which should permanently run from system power up.
- The compressor will continue to cycle on and off while the high pressure fault exists. The compressor's controlled cycle is to parameter **A6**; where the compressor will cycle with run intervals of **A6** time, followed by 15 minutes off.
- The alarm is ONLY overridden by unplugging and re-plugging cabinet into power supply.

Ed flashing...

Defrost has terminated on 'maximum defrost time' function (**dP**).

Confirm **dt**, **dP** and **d4** parameters are to SKOPE specification.

Possible causes of **Ed** alarm:

- High cabinet usage / high humidity, causing excessive ice build up. Change **dl** parameter from 6 to 4 if necessary.
- Defrost failure: If one or more of the defrost elements have failed; check element connections and cables. Check element resistance:
 - Coil element: 220 Ω approx.
 - Sump element: 180 Ω approx.
 - Cyclone unit defrost Amps: 4.8 Amps approx. (240V)
- Refrigeration unit defrost Amps is rated at 240 Volts, and includes condenser fan motor, but not cabinet which must be unplugged at 'cabinet' ENSTO connection on control box to test.

4 ELECTRONIC CONTROLLER

- Faulty defrost probe: When this has occurred **EI** and **Ed** blinks. If a faulty defrost probe occurs, the controller will only terminate the defrost cycle on time (see **EI** fault, on previous page).

df flashing...

- To indicate defrost in progress if parameter **d6** =0 (If programmed to SKOPE settings, **d6** =1).

EA, EB or EE displayed...

- Data acquisition failure. Reset procedure must be performed.

Reset Procedure

Performed by unplugging the cabinet, then press PRG key, keeping it pressed while plugging in the cabinet. The display will then show '**_C_**'. After a few seconds, access is gained to the parameters which will have reverted to the default settings; therefore the controller must be re-programmed to the SKOPE settings.

After modifying the parameters, press PRG key to exit the procedure and return to run mode.

If **EE** returns after the reset procedure, press def (down) until **EE** disappears. If it will not clear, the controller is defective.

Possible Causes of Controller Failure

- High humidity (over 85% R.H.).
- Excessive vibration or shock.
- Exposure to moisture.
- Exposure to corrosive or pollutant gases.
- Strong magnetic and/or radio interference.
- Exposure to direct sunlight or weather.

4 ELECTRONIC CONTROLLER

4.6 Replacement

Microprocessor Removal

1. Disconnect machine from power supply.
2. Loosen screws on top of sign sides.
3. Remove ventilated plain facia panel by sliding vertically up 30-40mm, to clear mounting lugs. Manoeuvre it into a position which allows ready access to the screw terminals at the top rear of the microprocessor.
4. Draw microprocessor out from the mounting clip.
5. Disconnect the microprocessor cables. A small screwdriver is required.

Microprocessor Installation

NOTE: Take care to avoid scratching visible surfaces of the cabinet.

1. Insert rear of microprocessor into the mounting clip.
2. With machine disconnected from power supply, push flat black connector cable into receptacle at rear of microprocessor, until it latches into place.
3. Connect 4 coloured cables into screw connectors, using a small electrical screwdriver - see Table 2 below, for terminal connection*.
4. Mount ventilated plain facia panel in position on refrigerator. Ensure microprocessor cables are out of sight and clear of moving parts.

Cable Colour	Screw Connection
Orange	Terminal 6
Blue	Terminal 7
Brown	Terminal 8
White	Terminal 9

Table 2:
CAREL Controller Terminal
Connection

5 SERVICE INSTRUCTIONS

5.1 System Service Notes

R404A Refrigerant

The refrigeration system utilises R404A refrigerant, which is a near azeotropic blend refrigerant. The compressor uses a Polyolester (POE) oil. There are special service handling requirements. Dedicated HFC equipment must be used:

- HFC refrigerant gauges
- HFC vacuum pump (with POE oil)
- R404A pressure temperature chart
- HFC compatible driers
- HFC leak detector (soap bubbles may be adequate)

With HFC R404A being a blend refrigerant, component separation is possible in the gas state. Therefore the system must be liquid charged. The liquid refrigerant should be very slowly charged into the compressor service valve which is cracked off the back seat by only 1/4 of a turn. R404A is a relatively stable blend.

Generally a partial loss of system refrigerant should not effect the composition of the remaining refrigerant to the point of effecting system performance, if this refrigerant is recycled.

POE Oil

The POE oil is highly hygroscopic, and therefore the compressor cannot be open to the atmosphere for longer than 15 minutes, without moisture contamination of the oil occurring. The HFC drier must be replaced during every refrigerant service procedure.

5 SERVICE INSTRUCTIONS

Sight Glass

The Danfoss SGN sight glass's primary function is to indicate system moisture content. The sight glass must always indicate dry refrigerant; if this is not so, the HFC drier must be replaced and the system evacuated before the compressor is damaged.

The sight glass will not necessarily indicate a correctly charged system, but it will indicate a system that is low on refrigerant. For a system to be low on refrigerant, a leak has occurred, which must be located.

Repairing a leak

Once the leak is found and the remaining refrigerant is removed, the compressor must be isolated to prevent moisture contaminating the compressor oil.

The method of isolation will vary depending on where the leak is and the time the system needs to be open. Slowly purging the compressor with dry nitrogen, or front seating the compressor service valve and brazing the discharge line closed are two suggested methods.

The leak can then be repaired, the drier replaced, the system reconnected, evacuated and charged. Always charge using scales.

The freezer has no high side pressure port. Generally it should not be required, but if it is necessary to measure discharge pressure or for a quick evacuation, a line tap valve can be connected to the liquid line process tube, and later must be removed.

Vapour must not be vented off the charging cylinder. To fully charge the cylinder, it should be evacuated and chilled.

5 SERVICE INSTRUCTIONS

5.2 Pre-Service Check Information

- Check setpoint by pressing SEL key (SKOPE setting -21°C).
- Check the airflow is not restricted by product blocking either discharge or return air-ports. Ensure that no product is stored below the bottom shelf.
- Check refrigeration unit is sealing properly to top of cabinet i.e. unit fixing screws secured down firmly enough to ensure no leaks.
- Check evaporator box lid is securely fastened and is sealing properly.
- During and after defrost the display locks onto the last displayed temperature until the system attains setpoint or after 60 minutes the real temperature is shown again.
- Check that system pressures are within normal ranges for the ambient conditions and cabinet temperatures.

Possible reasons for low pressure readings:

- Low refrigeration load
- Gas leak/s
- Restricted expansion valve
- Frozen evaporator coil

Possible causes of frozen evaporator coil:

- Evaporator fan failure
- Defrost failure
- Gas leak

If an electronic controlled unit is taken back to a workshop for repairs, it should be noted that in order to run the unit, you will either need to fit the original microprocessor supplied with cabinet or have a spare programmed microprocessor.

5 SERVICE INSTRUCTIONS

5.3 Interior Side Light

The fluorescent tube and starter are located inside the interior side light, and may be replaced without removing shelves or product from the cabinet. To replace the fluorescent tube and starter:

1. Compress the back section of the diffuser, so that it disengages from the aluminium housing and push the diffuser back, to gain access to the light.
2. The fluorescent tube and starter can now be removed. Revolve the tube until the pin position allows withdrawal.
3. Replace the tube and starter as necessary (see page 42 for spares).
4. When refitting the diffuser engage back section into the side light housing, and compress and snap front section of diffuser back into place, working progressively down the full length of light.

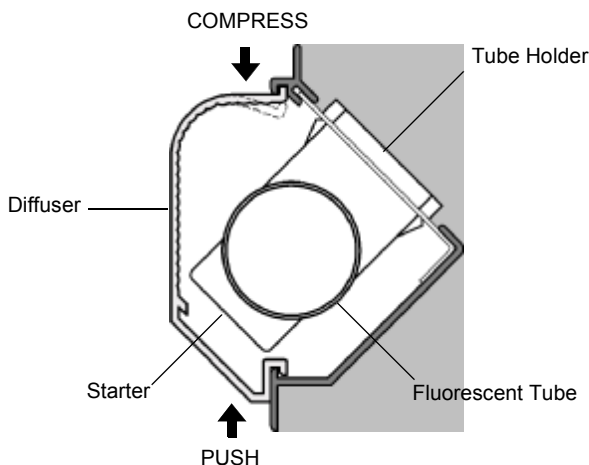


Figure 5: Interior Side Light

5 SERVICE INSTRUCTIONS

5.4 Doors

Door Alignment

This can be achieved by releasing the bottom hinge fixing bracket. The bracket is provided with slots allowing alignment adjustment.

Door Gasket Replacement

The door gaskets simply clip into the door frame extrusion and may be removed for repair or replacement simply by peeling from frame, starting at corner. New gaskets, when fitted, may be lightly lubricated with a clear silicone grease or similar compound. This will lessen the possibility of the gasket rolling. Should the gasket be out of shape when in place, use hot air (i.e. from hair drier) to realign.

Glass Door Removal

Disconnect cabinet from power supply. Slacken off door tension and remove pin. Disconnect door wiring from terminals. Unscrew top hinge and lift door clear of bottom pivot.

Glass Door Repair

To repair torsion bar assembly; turn door upside down and pull out old torsion bar. Angle torsion bar to clear the hook at end. Replace parts as required and refit. Reconnect door wiring to terminals.

NOTE: Glass replacement is not considered economical as the glass is fixed to the frame for integral strength. Door replacement is recommended.

Glass Door Tension

The door tension can be adjusted by rotating the capstan, mounted in the bottom hinge bracket. To achieve this, the split pin must firstly be removed. Using two 2.5mm diameter steel rods, the capstan can be rotated to provide the required tension. At this point the split pin can be re-inserted to lock torsion position.

5 SERVICE INSTRUCTIONS

Solid Door Removal

Unscrew door bottom hinge bracket, and slide door down to remove from top hinge.

Solid Door Tension

The solid door hinge mechanism has a preset tension and is non-adjustable. Ensure that the square notch in the hinge bracket mates correctly with the door hinge mechanism when replacing.

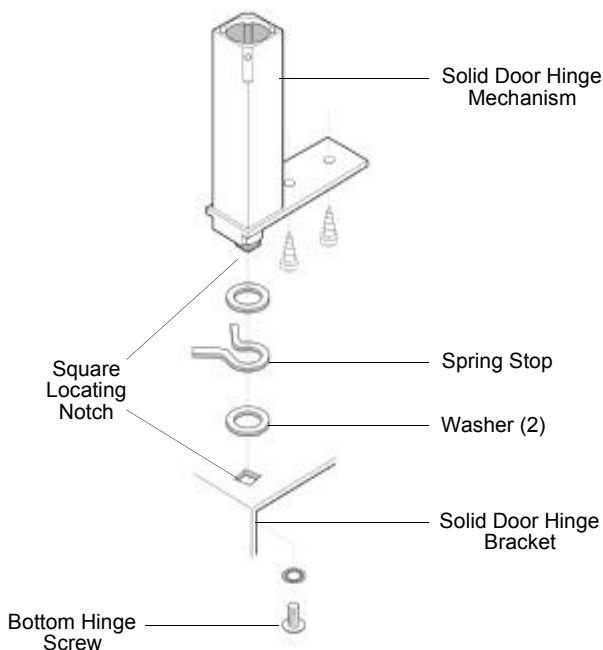


Figure 6: Solid Door Hinge Mechanism

5 SERVICE INSTRUCTIONS

5.5 Refrigeration Unit

SKOPE Cyclone® Unit Removal

1. Disconnect power supply from unit.
2. Remove ventilated plain facia panel.
3. Remove unit sign side panels.
4. Remove controller from holder.
5. Remove cabinet electrical cover.
6. Unplug cabinet power ENSTO plug.
7. Remove screws from front ENSTO plug box.
8. Remove locating screws from either side of unit and under ENSTO plug.
9. Place lifting hooks under unit support arms, as close to evaporator box as possible.
10. Remove unit from cabinet.

Caution:

Refrigeration unit weights approximately 68kg. Ensure all hazards are allowed for when removing unit.

Defrost over temperature cut-out

A defrost over temperature cut-out is fitted inside the evaporator box. It is a safety feature to turn off the elements at 55°C if they lock on. The switch is wired in series with the elements.

Condenser Fan/Motor Replacement

1. Disconnect motor flex from control box.
2. Undo three screws from motor mounting bracket, and remove complete assembly.
3. Remove securing cable ties if necessary.

5 SERVICE INSTRUCTIONS

Evaporator Fan/Motor Replacement

1. Remove evaporator box lid.
2. Undo screws from motor mounting bracket and remove complete assembly.
3. Reseal the flex hole in the evaporator box carefully on replacement.
4. Ensure motor bracket is replaced in correct position.

Probe Fault

1. If a faulty probe is signalled, remove the evaporator box lid, control box cover and securing cable ties.
2. Check the cable and its terminations.
3. Check probe resistance in ice water (resistance should be 27k ohms at 0°C).
4. Replace probe if necessary.
5. Ensure sensor is fitted in the original position, and re-assemble unit.

Defrost Elements

- 2 x Evaporator coil defrost elements
- 1 x Drain / Sump defrost element

5 SERVICE INSTRUCTIONS

Replacing Elements

The elements in the evaporator cannot be replaced without removal of the refrigerant and opening the lines.

This work should only be carried out by qualified servicemen, wearing safety glasses and safety gloves.

1. Disconnect unit from power supply.
2. Remove refrigerant.
3. Disconnect suction and liquid lines.
4. Remove top cover on unit and evaporator box cover.
5. Remove element leads from electrical connections inside terminal box
6. Remove evaporator fan assembly from unit.
7. Remove all evaporator fixing screws and lift evaporator assembly up.
8. Remove faulty element and replace.
9. Re-assemble evaporator assembly.
10. Check for leaks.
11. Recharge with scales.

Warning:

Ensure that suction and liquid lines do NOT crimp.

Compressor Electrics

Capacitors and relay are located inside the unit's electrical box.

5 SERVICE INSTRUCTIONS

5.6 Pressure Temperature Chart

TEMPERATURE		R134a		R404A	
°F	°C	KPa	psig	KPa	psig
-29.2	-34	-32	9.4	71	10
-27.4	-33	-28	8.4	79	11
-25.6	-32	-25	7.3	86	13
-23.8	-31	-21	6.2	94	14
-22.0	-30	-17	5.0	103	15
-20.0	-29	-13	3.8	111	16
-18.4	-28	-9	2.6	120	17
-16.6	-27	-4	1.3	129	19
-14.8	-26	0	0.0	138	20
-13.0	-25	5	0.7	148	21
-11.2	-24	10	1.4	158	23
-9.4	-23	15	2.2	168	24
-7.6	-22	20	2.9	179	26
-5.8	-21	26	3.7	189	27
-4.0	-20	31	4.5	200	29
-2.2	-19	37	5.4	212	31
-0.4	-18	43	6.3	224	32
1.4	-17	49	7.2	236	34
3.2	-16	56	8.1	248	36
5.0	-15	63	9.1	261	38
6.8	-14	69	10.0	274	40
8.6	-13	77	11.0	288	42
10.4	-12	84	12.0	302	44
12.2	-11	91	13.0	316	46
14.0	-10	99	14.0	331	48
15.8	-9	107	16.0	346	50
17.6	-8	116	17.0	361	52
19.4	-7	124	18.0	377	55
21.2	-6	133	19.0	393	57
23.0	-5	142	21.0	410	59
24.8	-4	151	22.0	427	62
26.6	-3	161	23.0	445	65
28.4	-2	171	25.0	463	67
30.2	-1	181	26.0	481	70
32.0	0	192	28.0	500	73
33.8	1	202	29.0	519	75
35.6	2	213	31.0	539	78
37.4	3	225	33.0	559	81
39.2	4	237	34.0	580	84
41.0	5	249	36.0	601	87
42.8	6	261	38.0	623	90
44.6	7	274	40.0	645	94
46.8	8	287	42.0	668	97
48.2	9	300	44.0	691	100
50.0	10	314	46.0	715	104

Table 3: Pressure Temperature Chart

5 SERVICE INSTRUCTIONS

5.7 Trouble Shooting

Complaint	Possible Cause	Repair
1. Compressor will not start: no hum.	Fuse removed or blown. No power. Overload protector tripped. Thermostat stuck in open position. Thermostat off, due to cold location. Wiring improper, or loose.	Replace fuse. Check reason. Refer to electrical section. Repair or replace control. Relocate control. Check wiring against diagram.
2. Compressor will not start: hums but trips on overload protector.	Improperly wired. Low voltage to unit. Start capacitor defective on CSIR or CSR motor. Run capacitor defective on PSC motor. Relay failing to close. Compressor motor has a winding open or shorted. Internal mechanical trouble in compressor.	Check wiring against diagram. Determine reason and correct. Determine reason and replace. Determine reason and replace. Determine reason and correct. Replace if necessary. Check resistance values. Replace compressor if necessary. Replace compressor.
3. Compressor starts, but does not switch off: starts winding.	Improperly wired. Low voltage to unit. Relay failing to open, due to welded contacts or relay incorrectly mounted. Run capacitor defective on CSR motor. Excessively high discharge pressure. Compressor motor has winding open or shorted. Check continuity and resistance. Internal mechanical trouble in compressor (tight). May be lubrication.	Check wiring against diagram. Determine reason and correct. Determine reason and correct. Replace if necessary. Determine reason and replace. Clean condenser. Check power input Watts. Possible overcharge, insufficient condenser cooling, or non-condensable gasses. Replace compressor if faulty. Replace compressor.

Table 4: Trouble Shooting Chart - continued on next page.

5 SERVICE INSTRUCTIONS

5.7 Trouble Shooting

Complaint	Possible Cause	Repair
4. Compressor starts and runs, but short cycles on overload protector (relay may chatter on RSIR, CSIR and CSR motors).	Additional current passing through overload protector.	Check wiring diagram. Check for added fan motors etc., connected to wrong side of protector.
	Low voltage to unit.	Determine reason and correct.
	Overload protector defective.	Check current, replace protector.
	Run capacitor defective on CSR motor.	Determine reason and replace.
	Excessive discharge pressure.	Check condenser, check ventilation, check for restrictions in refrigeration system.
	Suction pressure too high.	Check for possibility of misapplication.
	Compressor too hot - insufficient suction gas cooling.	Check refrigerant charge (fix leak), add if necessary. Check return vapour temperature and suction superheat.
	Compressor motor has a winding shorted.	Replace compressor.
5. Unit runs OK, but short cycles.	Overload protector.	See section 4 above.
	Thermostat: requires adjustment or incorrectly positioned.	Adjust or relocate thermostat.
	Incorrect refrigerant charge.	Adjust refrigerant charge.
6. Unit operates long or continuously. Unsatisfactory cabinet temperature.	Short of refrigerant.	Fix leak, and add charge.
	Overcharge of refrigerant.	Remove refrigerant to correct charge.
	Thermostat not cooling correctly.	Adjust thermostat (clockwise colder), and check thermostat bulb location. If necessary, replace thermostat.
	Freezer has excessive load.	Establish load within limits.
	Evaporator coil iced.	Defrost evaporator, check refrigeration. Check thermostat. Check door closing, seals etc.

Table 4: Trouble Shooting Chart - continued on next page.

5 SERVICE INSTRUCTIONS

5.7 Trouble Shooting

Complaint	Possible Cause	Repair
7. (continued) Unit operates long or continuously. Unsatisfactory cabinet temperature.	Restriction in refrigeration system.	Determine location and clear restriction. Flush with dry nitrogen. Replace component if blockage will not clear.
	Dirty condenser.	Clean condenser. Advise client how to regularly clean condenser.
	Inadequate air circulation.	Internal: Improve air movement, allow airflow around stock. External: Remove any restrictions to condensing ventilation.
	Compressor not pumping efficiently.	Replace compressor.
	Filter dirty (if applicable). Faulty fan motor.	Clean or replace. Check rotation. Replace if necessary.
8. Start capacitor open, shorted or blown.	Relay contact not opening properly.	Clean contacts, or replace relay if necessary.
	Prolonged operation on start cycle due to: (a) Low voltage to unit. (b) Improper relay.	(a) Determine reason and correct. (b) Replace relay.
	Excessive short cycling.	Determine reason for short cycling (see 5 above), and correct.
	Improper capacitor.	Determine correct size and replace.
9. Relay defective or burned out.	Incorrect relay.	Check and replace.
	Line voltage too high or too low.	Determine reason and correct.
	Excessive short cycling.	Determine reason (see 5 above), and correct.
	Relay being influenced by loose vibrating mount.	Remount rigidly.

Table 4: Trouble Shooting Chart - continued on next page.

5 SERVICE INSTRUCTIONS

5.7 Trouble Shooting

Complaint	Possible Cause	Repair
10. Suction line frosted.	Evaporator fan not running.	Determine reason and correct.
	Overcharge of refrigerant capillary systems.	Correct charge.
11. Unit noisy.	Loose parts or mountings.	Find and tighten.
	Tubing rattle.	Reform to be free of contact.
	Bent fan blade causing vibration.	Replace blade.
	Fan motor bearing worn.	Replace motor.

Table 4: Trouble Shooting Chart

6 WIRING DIAGRAM

6.1 Model: TMEF650

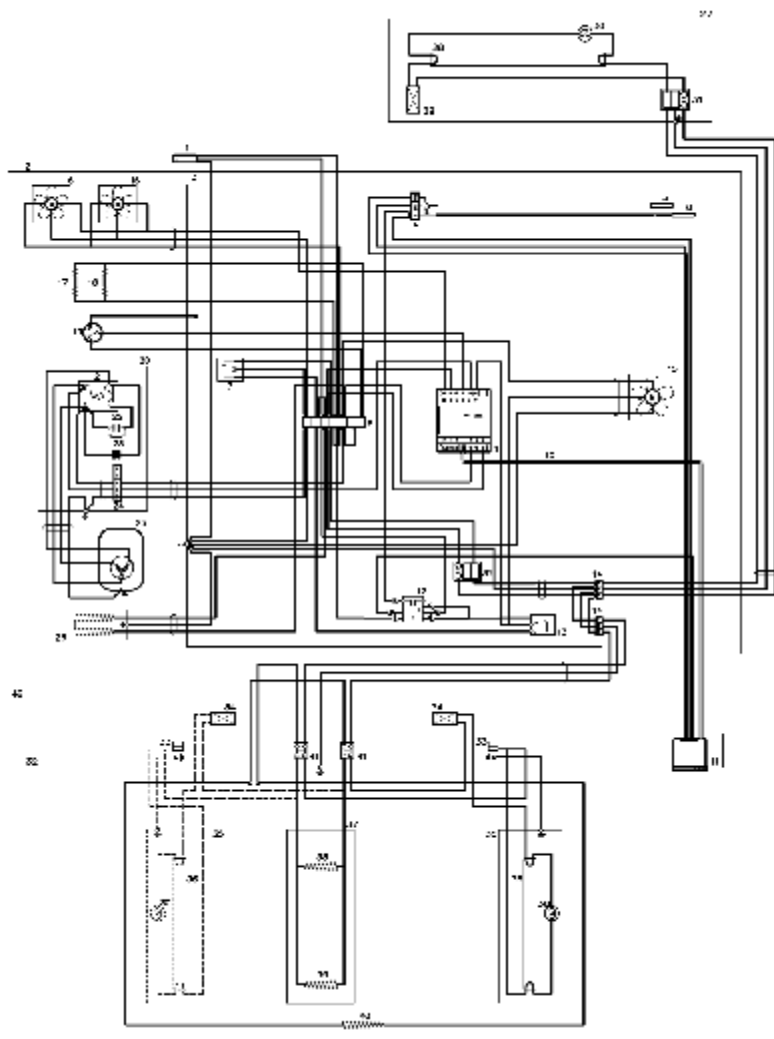


Figure 7: Wiring Diagram - glass door model

6 WIRING DIAGRAM

6.1 Model: TMEF650

Item	Part Description	Item	Parts Description
1	Mains Supply Flex	25	Compressor SC18CL
2	Refrigeration Unit	26	Drain Tube Heater
3	Control Box Assembly	27	Sign Unit Assembly
4	Probe Connector Block	28	20 Watt Fluorescent Tube
5	Ambient Probe	29	20 Watt Ballast
6	Defrost Probe	30	Starter
7	RFI Supp'n Capacitor	31	Fused Terminal Block
8	7-Way Terminal Block	32	Control Panel
9	CAREL Module	33	3.0 Amp Fuse
10	Module Supply Cable	34	60 Watt Ballast
11	CAREL Processor	35	Side Light Assembly
12	Latching Relay	36	58 Watt Fluorescent Tube
13	Pressure Switch	37	Heated Door Assembly
14	ENSTO Receptacle	38	85 W Glass Unit Element
15	Condenser Fan Motor	39	70 W Door Frame Element
16	Evaporator Fan Motor	40	60 W Cabinet Element
17	Defrost Element	41	4-Way Connector Block
18	Sump Element	42	Cabinet Assembly
19	Thermal Cutout		
20	Electrics Board		
21	Start Relay		
22	Start Capacitor (black body)		
23	Run Capacitor (silver body)		
24	Terminal Block		

7 SPARES

7.1 Cabinet Assembly

Part Description	SKOPE Part Number
INTERIOR SIDE LIGHT - Glass Door Only	
Side Light Assembly - R/H	V5060/670R-32
58 Watt Fluorescent Tube	ELL6267
Fluorescent Tube Shield	PLM6268
Side Light Diffuser	V5060/E71
58/65 Watt Ballast	ELZ8103
Starter	ELZ2840
Lamp Holder	ELZ6270
Lamp & Starter Holder	ELZ6271
CABINET	
Plain Facia Panel	E6300/E39-32
Control Panel Cover	E6300/R31-32
Shallow Shelf	WRKV6000/583-32
Shelf Bracket	V0973-99
Swivel Castor	SXX8488

7 SPARES

7.1 Door

Part Description	SKOPE Part Number
GLASS DOOR	
Glass Door Assembly - R/H	V6325/D01R
Glass Door Assembly - L/H	V6325/D01L
Glass Door Gasket	GKT4775
Top Hinge Assembly - R/H	V5301/388
Top Hinge Assembly - L/H	V5301/389
Bottom Hinge - R/H	V5000/393-32
Bottom Hinge - L/H	V5000/394-32
SOLID DOOR	
Solid Door Assembly - R/H	V6500/D40-02/32
Solid Door Gasket	GKT4888
Door Hinge Mechanism	HIN5780
Top Hinge Assembly - R/H	V7301/388
Stepped Bottom Hinge - R/H	V5000/D55R-32

7 SPARES

7.1 Refrigeration Unit

Part Description	SKOPE Part Number
Refrigeration Unit Assembly	E6358R-130X
Foamed Evaporator Box	L6300/221-S2
Foamed Evaporator Box Lid	L6300/225-S2
Compressor: WJ3ILZ	CPR7954P
Evaporator Coil Assembly	E6358/502
Evaporator Coil	CLS8839
Condenser Coil	CLS8841
Dryer	DRY8783
Pressure Switch	ELS7058
Unit Base	L6300/210-32
Discharge Line	E6358/255
Condenser Motor	L6300/404
Evaporator Motors (2 per)	ELM9020
Thermal Mass	V6301/784-32
Sump Element + 2 Terminals: ELT1133	ELE8850
Defrost Elements (2 per) + 2 Terminals: ELT1133	ELE8851
Sight Glass	REF7622
Control Box Assembly	E6358/E50X
RFI Suppression Capacitor	ELC8068
OMRON Relay	ELR6183
3.0 Amp Ceramic Fuse	ELZ6467
CAREL Controller - programmed	V5338/939
CAREL 4 Relay Module	ELZ9308
Module Supply Cable	ELZ7643
Probe Assembly	L6300/E49

8.1 Notes

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on its right side, suggesting it's resting on a surface.